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## (54) Nozzle for abrasive cleaning or cutting.

(57) A mixing nozzle for producing a jet of airborne abrasive slurry comprising a cylindrical air passage (6) of a length at least 2.5 times its diameter, a concentric circular chamber (7) surrounding the air passage and having a tangential entry (4) for the abrasive slurry, and a nozzle portion having a region (9) tapering from the diameter of the circular chamber to a cylindrical region (10). The cylindrical region (10) should have a diameter lying between 1.2 and 3.0 times that of the air passage and a length at least six times its diameter.

The air passage (6) and the concentric chamber (7) with its tangential entry (4) may be formed as a replaceable insert (5), which may be, for example, of rubber, plastics, ceramic, or sintered carbide.

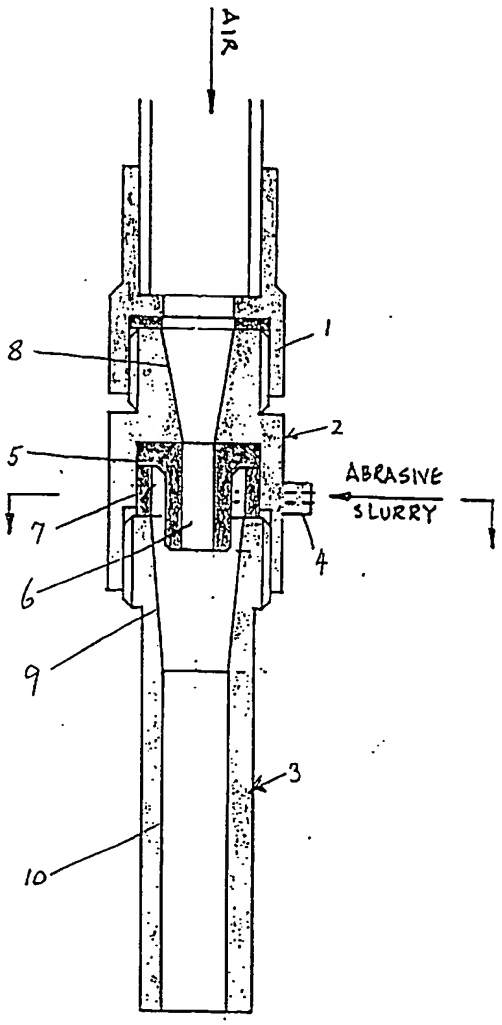


Fig 1

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The invention relates to a mixing nozzle for producing a jet of airborne abrasive slurry.

Abrasive particles, such as particles of mineral slag, sand or silicon carbide, carried in a jet of fluid, are used for cutting or cleaning structures of metal and other materials. If the abrasive is suspended in an air stream a large amount of dust results, which is highly offensive and poses a health hazard.

To reduce the amount of airborne dust it has been proposed to add water to the abrasive to form a slurry before introducing it into the air stream. The slurry so produced is then transferred to a mixing nozzle where it is introduced into a high velocity air jet.

It is an object of the invention, which is defined in the appended claims, to provide such a mixing nozzle which is capable of providing a uniformly-mixed well-directed jet of airborne abrasive slurry for cleaning or cutting purposes.

The invention will be further described with reference to the accompanying drawing, in which

Figure 1 is a longitudinal section through a nozzle according to the invention, and

Figure 2 is a cross-section on the plane 2-2 of Figure 1.

Referring now first to Figure 1 of the drawing, a high pressure air supply hose terminates in a fitment 1 having a female thread into which the nozzle assembly is inserted.

The nozzle itself comprises two sections, a mixer section 2 which attaches directly into the air hose fitment, and a nozzle portion 3 which screws into the front of the mixer section.

The mixer section 2 has an inlet 4 for the slurry, leading into a chamber within the mixer section into which is fitted an insert 5. This insert, which is subject to abrasive wear, is replaceable, and is preferably made of a wear-resistant material, which may range from rubber and plastics to ceramics and sintered carbides. The insert comprises a central tube forming an air passage 6, which is surrounded by by a ditch-like circular chamber 7. The slurry inlet 4 leads tangentially into this chamber. The arrangement will be clear from Figure 2, which is a cross-section through the mixer chamber at the position of the insert showing the air passage 6, slurry inlet 4 and circular chamber 5.

The air supply from the high pressure hose is led to the rear of the air passage 6 through a smoothly tapering jet section 8, which considerably increases the jet velocity by the time it reaches the air passage 6.

The nozzle portion 3 screws into the front of the mixer section 2 where it seals against the outer edge of the insert 5. This portion has a tapering region 9 surrounding the end of the air passage 6 and leading into a cylindrical region 10 at the exit from the nozzle.

In operation abrasive slurry pumped into the inlet 4 swirls round the the circular chamber 7 and spills over into the air stream emerging from the passage 6, where it is entrained and propelled through the nozzle portion 3. The Venturi effect produced by the geometry of the air passage and nozzle assists the flow of slurry, reducing the load on the slurry transfer means, and also helps to avoid settlement in the supply pipe.

To produce a compact uniform abrasive jet certain dimensional relations are essential in the geometry of the nozzle. In particular, the length of the air passage 6 should be at least 2.5 times its diameter, and the internal diameter of the cylindrical region 10 of the nozzle portion 3 should lie between 1.2 and 3.0 times that of the air passage 6, and its length should be at least six times its diameter. The length of the tapering region 9 is less critical, but it should not in any case exceed sixteen times the internal diameter of the cylindrical region 10.

## Claims

1. A mixing nozzle for producing a jet of airborne abrasive slurry comprising a cylindrical air passage (6) of a length at least 2.5 times its diameter, a concentric circular chamber (7) surrounding the air passage and having a tangential entry (4) for the abrasive slurry, and a nozzle portion having a region (9) tapering from the diameter of the circular chamber to a cylindrical region having a diameter lying between 1.2 and 3.0 times that of the air passage and a length at least six times its diameter.

2. A mixing nozzle according to claim 1 in which the length of the tapering region (9) does not exceed sixteen times the diameter of the air passage (6).

3. A mixing nozzle according to claim 1 or claim 2 having a tapering jet section (8) between the air inlet and the air passage to increase the air velocity at the air passage.

4. A mixing nozzle according to any preceding claim in which the air passage and the concentric chamber (7) with its tangential entry (4) are formed as a replaceable insert (5).

5. A mixing nozzle according to claim 4 in which the insert (5) material is of rubber, plastics, ceramic, or sintered carbide.

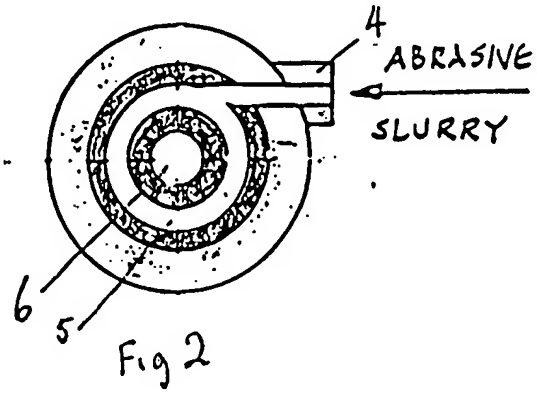


Fig 2

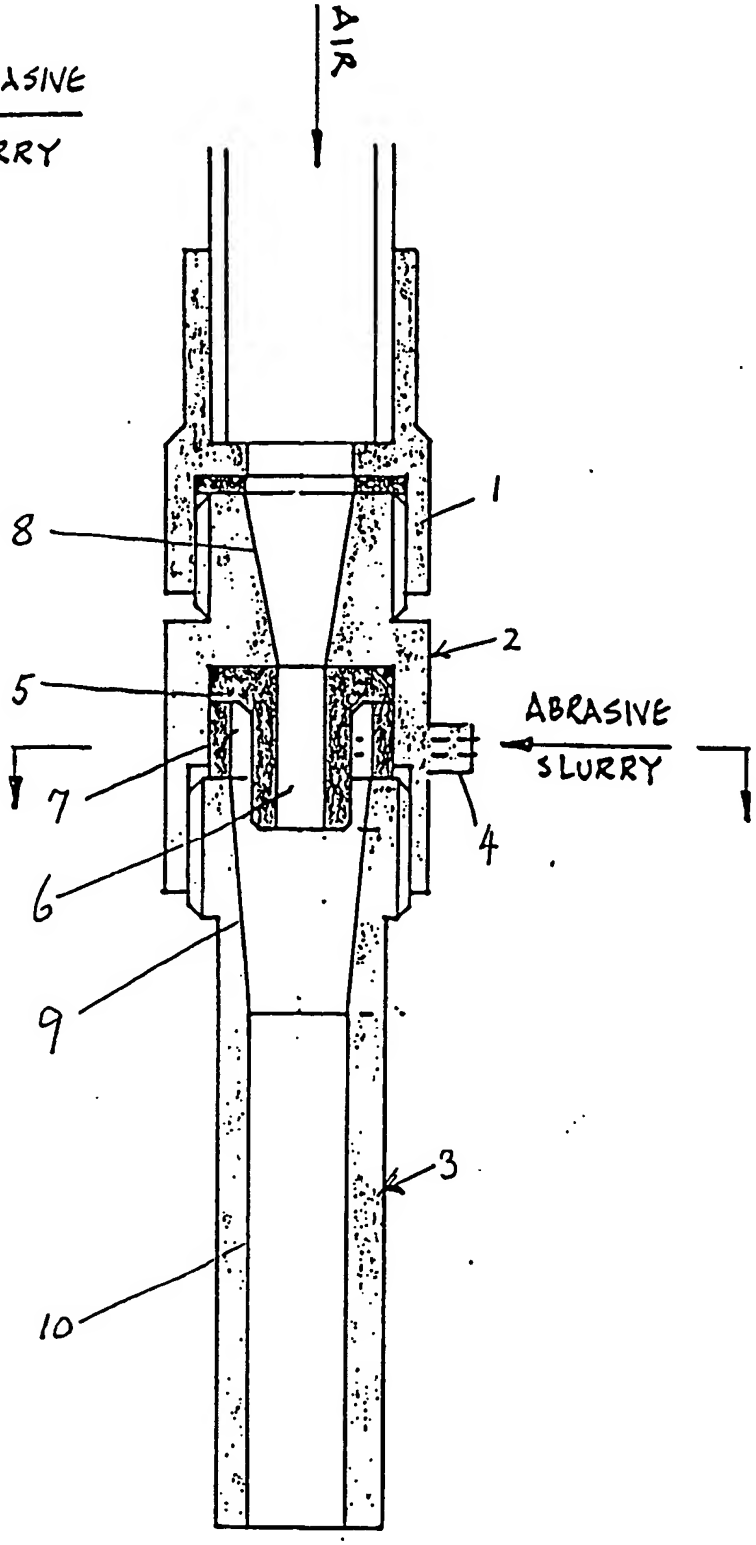


Fig 1

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# EUROPEAN SEARCH REPORT

Application Number
EP 92 30 6688

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl.5) |
|---|---|---|---|
| X<br>Y | DE-A-1 477 991 (VEB ELEKTRO)<br>* page 2, line 2 - line 12; figure 1 * | 1-3<br>4,5 | B24C5/04<br>B05B7/10 |
| Y | DE-A-2 128 453 (TUNZINI-S. A. M. E. S.)<br>* figure 2 * | 4,5 | |
| Y | US-A-2 608 801 (RIDLEY)<br>* column 2, line 31 - line 34; figure 1 * | 4,5 | |
| A | US-A-4 734 681 (SUZUKI)<br>* column 3, line 54 - column 4, line 4; figure 3A * | 1,2 | |
| A | EP-A-0 322 485 (INGERSOLL-RAND COMPANY)<br>* column 3, line 3 - line 7; figure 2 * | 1 | |
| A | WO-A-8 303 557 (FLUID ENGINEERING PRODUCTS LIMITED)<br>* figures 2,3 * | 1 | |
| A | FR-A-1 510 504 (S.A. DE MACHINES ÉLECTROSTATIQUE)<br>* figure 3 * | 4 | TECHNICAL FIELDS SEARCHED (Int. Cl.5)<br>B24C<br>B05B |
| A | US-A-4 253 610 (LARKIN)<br>* column 3, line 60 - column 4, line 25; figure 1 * | 4 | |
| A | GB-A-407 308 (MAXIM KARMINSKI)<br>* figures 2,3 * | 5 | |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| THE HAGUE | 20 OCTOBER 1992 | CARMICHAEL D.G. |

CATEGORY OF CITED DOCUMENTS

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